

## PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference G5455 PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP2004/006005	International filing date (day/month/year) 03.06.2004	Priority date (day/month/year) 04.06.2003
International Patent Classification (IPC) or both national classification and IPC F01D11/00		
Applicant UMICORE AG & CO. KG et al.		

1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:
- I ☒ Basis of the opinion
  - II ☒ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  04.04.2005	Date of completion of this report  27.09.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Degen, M  Telephone No. +49 89 2399-8612 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/EP2004/006005**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-7 as originally filed

**Claims, Numbers**

1-19 received on 04.04.2005 with letter of 04.04.2005

**Drawings, Sheets**

1/2, 2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/EP2004/006005**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**II. Priority**

1. ☒ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

☒ copy of the earlier application whose priority has been claimed.

☐ translation of the earlier application whose priority has been claimed.

2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid.

Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	2-12,14-18
	No: Claims	1,13,19
Inventive step (IS)	Yes: Claims	
	No: Claims	1-19
Industrial applicability (IA)	Yes: Claims	1-19
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item V.**

1. The following documents are referred to in this communication:  
D1 : US 2001/054281 A1 (ADAMS JOSEPH M ET AL) 27 December 2001 (2001-12-27)  
D2 : US 2002/112468 A1 (WOODROW BRUCE H ET AL) 22 August 2002 (2002-08-22)
2. **INDEPENDENT CLAIM 1, 13 and 19**  
The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent **claims 1, 13 and 19** is not new in the sense of Art. 33(2) PCT.
  - 2.1 Closest prior art document **D1** discloses (cf. Fig.5; Page 3,[37]):  
an apparatus for catalyst aging experiments and a method of testing using the apparatus, where a fluegas stream obtained in a combustor working under controlled firing conditions is mixed with another exhaust gas stream ([37]). The combined fluegas stream enters the catalyst to be tested. As described in **D1** (cf. abstract), the exhaust gas streams used in this non-engine based catalyst aging method are obtained by combusting fuel with air. It is obvious from the description (cf. [37]) that the second exhaust gas is of different nature compared to the first one as its use is that of simulating a certain overall flue gas composition (cf. "contaminants may be added") after mixing with the first exhaust gas.  
As the term "hot" used in claim 1 is open to any subjective appreciation and there is no indication in D1 of cooling said second combustion products stream, all the features of independent **claim 1** are disclosed.
  - 2.2 As already mentioned above, two fluegas streams are mixed together upstream the catalyst to be tested. It is assumed that the second fluegas stream in **D1** is obtained as well as the first in a combustor (i.e. in the combustor's burner) since this is the easiest way of obtaining a fluegas stream in a laboratory and a combustor is clearly mentioned as the source of exhaust gas (cf. abstract).
  - 2.3 It should be noted, that the subject-matter of **claim 13** is anticipated by nearly all existing

refineries or industrial plants where flue gases produced by several fired heaters or fired boilers are connected together to a single fluegas treatment unit, which may be a catalytic one (e.g. catalytic DeNO<sub>x</sub> or DeSO<sub>x</sub> systems). Such a refinery would be suitable for determining the activity of the catalyst in terms of aging behaviour.

- 2.4 The above argumentation applies in totality to the subject-matter of independent **claim 19**, which is therefore not acceptable under Art. 33(2) PCT.

**3. DEPENDENT CLAIMS 2-12, 14-18**

Dependent **claims 2-12, 14-18** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

The additional process or apparatus features are merely routine adaptations or slight constructional changes which come within the scope of the customary practice followed by persons skilled in burner/catalyst testing rigs, especially as the advantages thus achieved can readily be foreseen.

**4. Additional Remarks**

- 4.1 It should be noted that in all catalyst testing methods and facilities it is mandatory to obtain fluegas mixtures which are reproducible and which are comparable with the fluegases for which the catalyst is foreseen in reality. The feature of mixing two fluegases to obtain certain overall compositions (e.g. for simulating fluctuations from a standard composition) or the feature of adding other components is generally known in the art.
- 4.2 The feature of producing the fluegas by combustion in a burner (combustor) is generally known (cf. **D1**). Additionally, the advantages of using burners in testing facilities are straightforward: less expensive than e.g. by using an IC engine and more flexible.
- 4.3 In case applicant decides to enter the regional phase before the EPO, the claims shall, in addition to the above deficiencies under corresponding EPC Art. 54 and 56, comply with the requirements of Rule 29(2) EPC.

Claims

- 1 A method of determining activity and aging behavior of a catalyst by producing  $\langle - \rangle$   
a stream of hot combustion offgases having a defined pollutant composition by  
mixing <sup>the</sup> a first substream of hot combustion offgases with <sup>the</sup> a second substream of  
5 hot combustion offgases, passing the combustion offgases over the catalyst to be  
tested and determining the pollutant conversions effected by the catalyst.
2. The method as claimed in claim 1, wherein the first substream of hot combustion  
offgases makes up from 60 to 95% of the total mass flow of the two substreams.
3. The method as claimed in claim 2, wherein the first substream of hot combustion  
10 offgases is produced by burning a motor fuel in a first stream of combustion air  
and the second substream of hot combustion offgases is produced by burning  
gaseous hydrocarbons in a second stream of combustion air.
4. The method as claimed in claim 3, wherein the first substream of hot combustion  
offgases has an air ratio  $\lambda$  of greater than 1.
- 15 5. The method as claimed in claim 4, wherein ammonia or aqueous ammonia is  
introduced into the first and/or second stream of combustion air in order to  
increase the nitrogen oxide concentration in the combustion offgases.
6. The method as claimed in claim 4, wherein poisoning elements in the form of  
precursor compounds are added to the motor fuel.
- 20 7. The method as claimed in claim 3, wherein the air ratio  $\lambda$  of the second  
substream of combustion offgases is set to a value in the range from 0.5 to 3.
8. The method as claimed in claim 7, wherein water is introduced into the second  
stream of combustion air in order to avoid soot formation in the case of  
extremely rich operating conditions.
- 25 9. The method as claimed in claim 7, wherein hydrocarbons which are difficult to  
oxidize are added to the gaseous hydrocarbons.
10. The method as claimed in claim 3, wherein the temperature of the first  
substream of combustion offgases is reduced to a value in the range from 800 to  
200°C before it is mixed with the second substream of combustion offgases.

*< a first substream and a second substream of  
combustion offgases by two independent combustion  
processes and >*

11. The method as claimed in claim 10, wherein hydrocarbons, oil additives or further gaseous or vaporizable components are added to the mixed combustion offgases before they are brought into contact with the catalyst.
- 5 12. The method as claimed in claim 11, wherein the temperature of the mixed combustion offgases is set to a defined value before contact with the catalyst.
- 10 13. An apparatus (10) for determining the activity and the aging behavior of a catalyst (20), which comprises a first burner (30) having an offgas line (40) in which the catalyst is located, wherein the apparatus further comprises a second burner (50) having an offgas line (60) which opens into the offgas line (40) of the first burner (30) upstream of the catalyst (20).
14. An apparatus as claimed in claim 13, wherein the first burner (30) is a liquid fuel burner which is supplied via the feed line (32) with a motor fuel as fuel and via the feed line (31) with a first stream of combustion air.
- 15 15. An apparatus as claimed in claim 14, wherein the second burner (50) is a gas burner which is supplied via the feed line (52) with a gaseous fuel and via the feed line (51) with a second stream of combustion air.
16. An apparatus as claimed in claim 15, wherein both offgas lines contain lambda probes (41) and (61).
- 20 17. An apparatus as claimed in claim 16, wherein a first heat exchanger (42) and a first temperature sensor (43) are provided in the offgas line of the first burner upstream of the junction with the offgas line of the second burner.
18. An apparatus as claimed in claim 17, wherein a second heat exchanger (44) and a second temperature sensor (45) are located in the offgas line of the first burner downstream of the junction with the offgas line of the second burner.
- 25 19. An apparatus for determining activity and aging behavior of a catalyst, in particular for implementing a method as claimed in any of claims 1 to 12, comprising:  
a facility for producing a stream of hot combustion offgases having a defined pollutant composition, where the production facility has a first facility for providing a first substream of hot combustion offgases, a second facility for providing a second substream of hot combustion offgases and a facility for  
30 *being independent from the first facility*

mixing the first substream and the second substream,  
a facility for passing the combustion offgases over the catalyst to be tested and  
a facility for determining the pollutant conversion effected by the catalyst.

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